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ABSTRACT

This paper introduces a rationale and format for the introduction of microcomputers into the classrooms of British Columbia on a cost-effective basis. The three purposes of the paper are (1) to briefly present the activities of the Minnesota Educational Computing Consortium (MECC); (2) to describe in general terms how British Columbia might benefit from the MECC experience through a particular adaptation to provincial needs; and (3) to encourage discussion among, and reaction from, the educational community. Descriptions of the background, operations, and specifications of hardware and software of MECC are followed by suggestions for the development of a similar service in British Columbia. The suggestions include a small scale adaptation to meet ten presently identified needs. The paper concludes with a request for reader reactions to add to J.E.M. (Joint Educational Management) Projects information on the viability of the suggested J.E.M. involvement, specification of school/district needs, identification of individuals who would be willing to share in the project, and identification of school districts which would consider first stage involvement. (CHC)

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EDUCATIONAL COMPUTING

DISCUSSION PAPER 11/79

IMPLICATIONS OF MECC FOR B.C. SCHOOL COMPUTER DEVELOPMENT

by

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Score along line and detach

The following is a discussion paper which has evolved from the work presently being conducted by J.E.M. Projects on behalf of the Ministry of Education, Science and Technology. Its purpose is to obtain reaction to the ideas presented.

We encourage you to complete, detach and mail this form to the J.E.M. Projects office, Discovery Park, Box 1700, Victoria, B.C. V8W 2Y2, or phone Dr. A. E. Wright, Research Director, J.E.M. Projects at (604) 477-7246.

Comments: _____

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1.0 INTRODUCTION

The ideas presented in this Discussion Paper constitute one outgrowth of the work conducted in a cluster of J.E.M. Projects (280/285) all of which investigated various aspects of the application of computers to education. Specifically, the paper introduces a rationale and format for the introduction of micro-computers to the classrooms of British Columbia on a cost-effective basis.

This approach is predicted on the need to:

(a) Ensure that an acceptable standard of computer literacy is available to the students of the province;

(b) Employ available technology in a reasoned and appropriate manner for the general enhancement of education; and,

(c) Answer the requirements of members of the educational community who have perceived both a problem and a need at the school level and who wish to work towards resolution.

1.1 PURPOSES

The paper has three purposes:

(1) To present, in brief, the activities of the Minnesota Educational Computing Consortium;

(2) To describe, in general terms, how British Columbia might benefit from the MECC experience through a particular adaptation to provincial needs;

(3) To encourage discussion among, and reaction from, the education community.

2.0 RATIONALE

The question of computer literacy is one which educators are clearly having to take very seriously. The following extract illustrates the need quite vividly (Time, February 20, 1978):

> Seymore Pappert, Professor of Mathematics and Education at M.I.T., estimates that there will be 5 million private computers in people's homes and available to students within two years. By 1982, he predicts, 80% of upper middle class families will have computers "capable of playing important roles in the intellectual development of their children." Says California author, Robert Albrecht, a pioneer of electronic education: "In schools, computers will be more common than carousel slide projectors, movie projectors, and tape recorders. They'll be used from the moment school opens, through recess, through lunch period, and on as far into the day as the principal will keep the school open." Author Ray Bradbury reports, "Across the country 'these magical beasts' are assisting hassled, often incompetent teachers. They are revivifying soporific students, dangling and delivering intellectual challenges beyond the ken of most educators. 'Millions of buildings' worth of outdated literature and information will be stored on tiny capsules for retrieval when needed. There's too damn much paper around anyway." U.C.L.A. Professor of Computer Science, Gerald Estrin, says "The computers provide an intensely visual, multisensory experience that can take a youngster in a matter of a few months to a level he might never reach without it, and certainly would not reach in less than many, many years of study by conventional methods." In Minnesota, 2200 educational computer terminals, from tiny farming communities to the Twin

> Cities, reach 92% of all students in the state. With a more than $1 million annual state grant for long distance telephone charges, students are hooked into the state-wide network by which, among other projects, social studies students can simulate a national election, young biologists analyse the pollution of a lake, and future farmers learn how best to manage a given number of acres.

Technology has continued to progress since this article was written. The range of options open to educators continues to expand. There is an immediate need for some serious, systematic attempt to familiarize students with computers, to dispel the mythology surrounding computers and to ensure the opportunity for computer literacy, through the education system.

In British Columbia, the move towards filling this educational gap has manifested itself in the realization that hardware can now be acquired at a relatively low cost for school use. As individual schools and school districts move towards this method of resolution, the need for some kind of guidance and planning is becoming evident; more specifically, some sort of economic and pedagogic safeguard would be desirable. It is in pursuit of such a service that the MECC activities are presented here.

3.0 THE MINNESOTA EDUCATIONAL COMPUTING CONSORTIUM: BACKGROUND

MECC has devised a policy for a state computer service agency which provides maximum service with a minimum loss of local autonomy. Among its products are: A standardized test for computer literacy; the raising of the computer literacy standards of Minnesota to the highest in the U S. (as measured); development of an extensive CYBER time-sharing system for the static schools; promotion of the PLATO computer system developed by the University of Illinois, and design specifications for the "ideal" micro-computer for multiple uses at all levels of the education system.

In its capacity as a service agency for education, MECC set up four task forces to deal with the following problem areas:

(1) The need to acquire cheaper terminals;

(2) The need to test the new micro-technology;

(3) The need to improve computer service;

(4) The need to regain the enthusiasm of those students and teachers who, in the past, had had poor experiences in relying on costly phone lines.

The new "micros" were found to be the cheapest and most reliable terminals. In addition, they are to be taken seriously as start-alone computers. They are easily serviced in that parts may be exchanged with a central service bureau and, as in MECC's case, programs can either be mailed on floppy disks or downloaded quickly at low phone rates from the already purchased CYBERS.

The micros need not sit near a telephone line and require no costly operation or co-ordination. Weighing 22 lbs. in a vinyl carrying case, the micros have immediate appeal for teachers.

The MECC specifications were sent out to tender and APPLE won the bid. When MECC selected APPLE, it instituted a policy that while schools could choose any system they wished, only APPLE (plus the pre-existing CYBER and PLATO systems) would receive MECC support.

3.1 THE MINNESOTA EDUCATIONAL COMPUTING CONSORTIUM: OPERATIONS

Because MECC purchases machines in quantity, it is able to pass the discount savings on to the schools. It does what servicing it can on the machines and co-ordinates interaction with the suppliers service department. This is essential in that no micro-manufacturer can afford to support a machine to the same extent as the manufacturers of the older, larger machines. In other words, low-cost micro computers do not come with a free "hand-holding" service, as do more expensive computers. Most programming, software and courseware development is done by MECC's staff of seventy-five, supported by APPLE. MECC charges for its service to its own schools according to an (approximately) real-cost formula.

3.2 SPECIFICATIONS

Within six months, APPLE may not be the best buy in educational computers on specifications alone. After all, a study of computers completed in March was completely out of date in May (1979). The new Texas Instruments machine and several others are expected to challenge APPLE before Christmas. But the cost of software and courseware - programs and curricular materials - far exceeds the cost of machines (from $1,750.00 to $14,000.00 each). The cost of a machine is only a fraction of one year's salary for a programmer, analyst, coordinator, or teacher; and a fund of material is all ready for sharing with other APPLE users. What does an APPLE look like? What packages exist for it?

An APPLE micro computer is the size of a portable typewriter. It can be attached in seconds to any colour T.V. set - including the large video-tape screens common in schools. It can be carried home and attached to the family T.V. set. Such a machine with 48 thousand bytes of memory (over twice the size of most mini-computers) costs about $1,750.00. The APPLE can be attached to two floppy mini-disk units (the size of chalk boxes) containing 100k storage each ($850.00 for the first, $550.00 for the second). A large disk (2 megabyte) can be attached for about $2,600.00. A ten megabyte disk costs $7,000.00. A card reader (reading both optically marked or punched cards - about the size of a small file cabinet drawer) costs $4,300.00 and is useful (one/school) for allowing students to prepare data and homework assignments away from the computer, and for permitting off-line data preparation for the school administration. A good printer (the size of a large typewriter), which can do word processing (editing and rearranging text, etc.), and which can type even single pages with typewriter quality, costs about $3,600.00. Many peripherals can be attached such as the ALF II - a device which permits the computer to produce three part harmony and sells for $175.00. VOTRAX, which produces a human sounding voice, is most helpful for language drill and practice. A 'fully loaded' APPLE would sell for

$14,000.00 Canadian, unit price. It would appear (according to A.J. Layman, APPLE's Canadian Vice-President) that fairly high discounts can be realized by quantity purchase. A school's first APPLE could probably be purchased for about $8,600.00 if quantity buying discounts were applied. Additional computers would be much cheaper as extra disks, printers, and card readers would be unnecessary. Each of these machines would be capable of acting as a terminal onto any number of large computers and thereby download programs and data by phone line or upload locally developed programs and data. Low-cost night telephone rates could be used. The machines could be used alone to teach programming skills. The machines could be used to provide service packages in many subject areas - simulations in social studies and science, calculations and graphs in math and science. One important use of the machines, which is just now 'coming of age', is for C.A.I. (Computer Assisted Instruction). C.A.I. packages now developed for the APPLE (and available for not much more than the cost of a floppy disk - $7.50) include some of the following: a fraction drill and practice program in which students shoot darts (equivalent fractions) at coloured balloons (decimals) making them explode with full colour and sound effects; a plane geometry package in which coloured animated figures are manipulated and superimposed (programmable colour graphics are built in); a music theory program which, after examining and recording one's present knowledge of music theory, manages a course of instruction in which music is played by the computer while coloured chords flash on the screen. Chords, which are heard but not seen, are entered into the keyboard, marked and corrected; an English 'strands' program of drill and practice in usage and grammar; a driver education package simulating and testing a knowledge of road signs; a state capitals quizzer. Currently under development are packages for: participation movies for developing creative writing skills - the pupil makes choices and actually creates the story for a cartoon movie; computer managed instruction (CMI) - where pupils are supplied text and assignments - including library and group assignments, and marked and guided in their activities with short print-outs. The

teacher using CMI is supplied with a record of progress and diagnosis of difficulties. Each student's work is individually prescribed thereby eliminating copying of time wasted in needless review. Work sheets are produced in areas which do require drill and review.

The total cost is comparable to that of a video centre. With the new video disk, traditional movies, slide projectors and computer graphics can be combined, so that still pictures, animation, movies, computer controlled colour graphics and sound are available for less than a video recorder, camera and monitor.

4.0 A BRITISH COLUMBIA ADAPTATION

The B.C. environment differs educationally, demographically, and geographically from that of Minnesota; however, parts of the MECC experience and expertise may be used as the foundation for meeting the requirements of this province. An outside sharing formula has recently been devised by MECC, along with a list of available software, and initial contacts suggest that a basis exists for developing a similar service in B.C.

Availability of hardware and software at reasonable cost is only one aspect which has to be considered. Equally important is the manner in which school districts and, ultimately, schools can be provided with a flexible, cost-effective service to meet their needs. Clearly, the large and diverse MECC structure cannot be justified in terms of this province's requirements. The following suggests a small scale adaptation to meet presently identified needs:

(1) The service will be formulated as a J.E.M. project and a core staff will be retained, consisting of a co-ordinator, technician and secretary.

(2) Machines will be bulk-purchased at the request of school districts, which will benefit from the subsequent discount, part of which will support the service agency operation.

(3) There will be no requirement to purchase through the agency, but in order to keep costs low so that as many school districts as possible may benefit, only the hardware and software supplied through the agency will receive its support.

(4) Apart from the cost effectiveness of this approach, there are a number of advantages for school districts:

(a) assistance with planning and purchasing;
(b) provincial contacts;
(c) availability of a local servicing facility;
(d) easy acquisition of a variety of software.

(5) Initial funding for a B.C. Educational Computing Project will be channelled through Joint Educational Management Projects. As school districts become involved in purchasing, and as more of them contribute to higher discounts, the agency will become almost self-supporting in four to six years.

(6) The system will allow:

(a) the distribution of programs at lower than textbook prices, which can be modified and updated without being replaced;

(b) the achievement of computer literacy through the schools;

(c) the individualization of drill and practice, and creative enrichment;

(d) the effective management of pupil learning at the classroom level;

(e) the expansion of the curriculum of small schools, where additional staff and supplies are not feasible alternatives;

(f) the creation of options in distance education;

(g) the availability of an in-house computer for administration;

(h) the augmenting of courses with simulations, which are interactive and cheaper than films;

(i) the teaching of computer program writing for business, industry and vocationally directed pursuits;

(j) the use of computing for the benefit of the whole school, under the control of the local school and community.

(7) In addition to three "core" staff members, seven regional field co-ordinators (classroom teachers provided with equipment and an honourarium) could serve the whole province.

(8) The MECC material, plus material developed locally and by other educational jurisdictions, could be shared on floppy disks for less than the cost of a newsletter service. The material thus made available would be ready for immediate use (without adding to the preparation time of classroom teachers) and would be developed, increased and revised in the field for B.C. conditions.

(10) For such a project to succeed, it must, realistically, have the support and authority of the Ministry of Education, Science and Technology as well as the membership of enough school districts to make it initially cost-effective.

(10) The degree to which school districts become involved is subject to the autonomous authority of local school boards and their schools.

5.0 DISCUSSION

British Columbia was among the first regions in the world to use computers in education (1965); however, progress since then has been slow. The province has a relatively small population, and cannot necessarily support a complex system development at the school level. On the other hand, it can benefit from the experience of other areas on a shared basis.

So far, there are no large sums of money tied up in ineffectual, large systems, yet there is a cadre of well-trained and sophisticated computer educators available in the province.

Possibly, there are or soon will be, systems available which are just as effective as the MECC/APPLE operation. However, we are in a position at the moment of having to decide on a starting point. MECC is willing to share its expertise, experience and materials with British Columbia at reasonable cost, and the system has been shown to be successful; the wheel need not be re-invented.

J.E.M. Projects is continuing its investigation into this topic and welcomes reaction which will add to its information on:

(a) the viability of the suggested J.E.M. involvement;

(b) specification of school/district needs;

(c) identification of individuals who would be willing to share in the project;

(d) identification of school districts which would consider first stage involvement.

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